

Climate change could wipe out a third of parasite species, study finds

Parasites such as lice and fleas are crucial to ecosystems, scientists say, and extinctions could lead to unpredictable invasions



An assortment of specimens from the Smithsonian's parasite collection. Photograph: Paul Fetters for the Smithsonian Institution/Courtesy of Science Advances

[Damian Carrington](#) Environment editor, Wednesday 6 September 2017 14.08 EDT Last modified on Wednesday 6 September 2017 14.20 EDT

[Climate change](#) could wipe out a third of all parasite species on Earth, according to the most comprehensive analysis to date.

Tapeworms, roundworms, ticks, lice and fleas are feared for the diseases they cause or carry, but scientists warn that they also play a vital role in ecosystems. Major extinctions among parasites could lead to unpredictable invasions of surviving parasites into new areas, affecting wildlife and humans and making a “significant contribution” to the sixth mass extinction already under way on Earth.



The new research, [published in Science Advances](#), used the collection of 20m parasites held at the Smithsonian Institution's Museum of National History in the US to map the global distribution of 457 parasites. The scientists then applied a range of climate models and future scenarios and found that the average level of extinctions as habitats become unsuitable for parasites was 10% by 2070, but extinctions rose to a third if the loss of host species was also included.

“It is a staggering number,” said Colin Carlson at the University of California, Berkeley, who led the new work. “Parasites seem like one of the most threatened groups on Earth.” The severity of the impact varied with the different climate scenarios. For example, a 20% loss of parasite native ranges in scenarios where carbon emissions are rapidly cut in the future rises to 37% if emissions continue unchecked.

“Parasites are obviously a hard sell,” said Carlson. “Even if you are grossed out by them – and there are obviously downsides for individual hosts and for humans – parasites play a huge role in ecosystems.” They provide up to 80% of the food web links in ecosystems, he said. Having a wide range of parasites in an ecosystem also

means they compete with one another, which can help slow down the spread of diseases.

“If parasites go extinct, we are looking at a potential massive destabilisation of ecosystems [which] could have huge unexpected consequences,” Carlson said, with other parasites moving in to take advantage. “That doesn’t necessarily work out well for anyone, wildlife or humans.”

One example of the complex role parasites can play is a [hairworm that lives in grasshoppers](#) in Japan and tends to lead its host to jump into water, where the grasshoppers become a major food source for rare fish. “In some subtle ways, parasites are puppeteers,” Carlson said.

The research analysed more than 50,000 records of the 457 parasite species, which the researchers

believe provides a representative picture. But, with more than 300,000 species of parasitic worms alone known to exist, working out the specific impact of parasite extinctions on diseases is complex and remains to be done.

“It is difficult to summarise the net consequence, as we know so little about most parasites,” Carlson said. “Climate change will make some parasites extinct and make some do better. But we would argue the overall phenomenon is dangerous, because extinctions and invasions go hand in hand.”

Anna Phillips, the curator of the Smithsonian’s parasite collection, said: “As long as there are free-living organisms, there will be parasites. But the picture of parasite biodiversity in 2070 or beyond has the potential to look very different than it does today based on these results.”